The following is claimed:

1. A method for adjusting antenna radiation for a wireless network or segment thereof, the method comprising the steps of:

varying antenna radiation directions of a plurality of antennas throughout ranges of antenna radiation directions;

measuring signal parameters for the varied antenna radiation directions for a plurality of measurement locations;

determining a resultant antenna radiation direction within the ranges for each of the antennas in the wireless network or segment thereof based upon the measured signal parameters.

2. The method according to claim 1 wherein the resultant antenna radiation direction is defined as a two dimensional vector representing angle of azimuth from a corresponding antenna and a down-tilt angle from the corresponding antenna.

3. The method according to claim 1 wherein a candidate antenna radiation direction, for the resultant antenna radiation direction, is defined as including a central vector representing a peak gain of a main lobe of radiation, a first limit vector representing a first limit of radiation direction states, and a second limit vector representing a second limit of radiation direction states.

4. The method according to claim 1 wherein the measuring step comprises measuring signal strengths as the signal parameters at the measurement locations.

5. The method according to claim 1 wherein the determining step comprises determining a system-wide minimal average of an interference signal strength over a group of the measurement locations and identifying a constellation of resultant antenna radiation directions associated with the system-wide minimal average for the group.

6. The method according to claim 1 wherein the determining step comprises determining a system-wide minimal average of an interference signal strength plus background noise over a group of the measurement locations and identifying a constellation of the resultant antenna radiation directions associated with the system-wide minimal average for the group.

7. The method according to claim 1 wherein the determining step comprises determining a system-wide maximum signal-to-noise ratio average over a group of the measurement locations and identifying a constellation of resultant antenna radiation directions associated with the system-wide maximum for the group.

8. A method for adjusting antenna radiation for a wireless network or segment thereof, the method comprising the steps of:

varying antenna radiation directions of a plurality of antennas throughout ranges of antenna radiation directions in accordance with a schedule;

measuring signal strengths for the varied antenna radiation directions for a plurality of measurement locations;

organizing the measured signal strengths into a location measurement data structure corresponding to each measurement location;

determining resultant antenna radiation directions within the ranges for the antennas in the wireless network or segment thereof based upon data in the location measurement data structure to reduce or minimize radio frequency interference in the wireless network.

9. The method according to claim 8 further comprising the step of:

deriving averages of interference from the measured signal strengths and associating each average of interference with candidates for the resultant antenna radiation directions.

10. The method according to claim 8 wherein the determining step further comprises comparing successive averages of interference measurements associated with

corresponding candidates for the resultant antenna radiation directions to identify the candidates associated with a lower of a presently determined average of interference measurements and a previously determined lowest average of interference measurement.

11. The method according to claim 8 further comprising the step of:

selecting the resultant antenna directions as candidates corresponding to the lower of the presently determined average of interference and the previously determined lowest average of the interference measurement.

12. The method according to claim 9 wherein the deriving step further comprises assigning each of the measurement locations a corresponding weight factor for calculating a weighted average to replace and supercede the average of interference, a total of the measurement locations having an aggregate weight factor approximately or exactly equal to one.

13. The method according to claim 8 wherein the determining step further comprises the steps of:

generating a random number to choose candidates for the resultant radiation pattern directions associated with an average lowest system-wide interference over the measurement locations;

evaluating a probability that the chosen candidates actually provides the average lowest system-wide interference;

estimating the chosen candidates as the resultant radiation pattern directions providing the average lowest system wide interference if the evaluated probability meets a requisite confidence criteria.

14. The method according to claim 8 wherein the determining step applies the following equation in accordance with an intensive procedure for determining a constellation of the resultant antenna radiation directions associated with a lowest average system-wide interference over the measurement locations:

$$Q(\mathbf{e}^{(k)}) < Q_{min},$$

wherein k is an iteration number, and $\mathbf{e} \in [\theta Li, \theta Ui] \times [\phi Li, \phi Ui]$, Q_{min} represents the lowest average system wide interference, $Q(\mathbf{e}^{(k)})$ represents a proposed minimum average system-wide interference corresponding to a candidate constellation of antenna radiation directions expressed as $\mathbf{e}^{(k)}$.

15. The method according to claim 8 wherein the determining step applies the following equations in accordance with an simulated- annealing procedure for determining a constellation of resultant antenna radiation directions associated with a lowest average system-wide interference over the measurement locations:

$$x_{k+1} = \begin{cases} y_{k+1} & p \le a(x_k, y_{k+1}, c_k) \\ x_k & otherwise \end{cases}$$

$$a(x_k, y_{k+1}, c_k) = \min\left\{1, \exp\left(-\frac{E(y_{k+1}) - E(x_k)}{c_k}\right)\right\}$$

wherein $a(x_k, y_{k+1}, c_k)$ is a function providing a probability value between 0 and 1 for deciding whether or not to set $x_{k+1} = y_{k+1}$ or $x_{k+1} = x_k$, wherein $E(y_{k+1})$ represents a current pseudo-energy state, $E(x_k)$ represents a previous pseudo-energy state, x_k represents a previous value of a candidate

constellation of antenna directions, y_{k+1} represents a new proposed value of a candidate constellation of antenna directions, c_k is an iteration control parameter, and k represents an iteration step, and $x_k = e^{(k)}$ where $\mathbf{e}^{(k)}$ represents a candidate constellation of antenna radiation direction states corresponding to an iteration step k.

16. The method according to claim 15 further comprising the step of updating c_k as c_{k+1} for a next iteration in accordance with the following equation:

$$u(x_0, x_1, \ldots, x_k, y_{k+1}) = \max_{i=0}^{k} \{E(x_{i+1}) - E(x_i)\} / \ln(k+1)$$

wherein x_{k+1} on a right side of the equation is understood as y_{k+1}.

17. The method according to claim 8 wherein the organizing step includes the location data structure comprising a matrix conforming to the following mathematical expression:

$$\begin{pmatrix} S_1(x,e_1^1) & S_1(x,e_2^1) & \cdots & \cdots & S_1(x,e_q^1) \\ S_2(x,e_1^2) & S_2(x,e_2^2) & \cdots & \cdots & S_2(x,e_q^2) \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ S_n(x,e_1^n) & S_n(x,e_2^n) & \cdots & \cdots & S_n(x,e_q^n) \end{pmatrix}$$

wherein S represents measured signal strength in power, a subscript of S represents a base station identifier up to an nth base station identifier, x represents a measurement location, e represents an antenna radiation direction among q possible antenna radiation directions as a subscript of e, and n possible antenna identifiers as a superscript of e.

18. The method according to claim 8 wherein the determining step includes the background noise conforming to the following mathematical expression:

$$\begin{pmatrix} N_1(x,e_1^1) & N_1(x,e_2^1) & \cdots & \cdots & N_1(x,e_q^1) \\ N_2(x,e_1^2) & N_2(x,e_2^2) & \cdots & \cdots & N_2(x,e_q^2) \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ N_n(x,e_1^n) & N_n(x,e_2^n) & \cdots & \cdots & N_n(x,e_q^n) \end{pmatrix}$$

wherein N represents measured noise power, a subscript of N represents a base station identifier up to an nth base station identifier, x represents a measurement location, e represents an antenna radiation direction among q possible antenna radiation directions

possible antenna radiation directions, as a subscript of e and n possible antennas, as a superscript of e.

19. The method according to claim 8 wherein the varying step changes the antenna radiation directions throughout the ranges of radiation states in a manner commensurate with a stationary or mobile duration of a test receiver being coincident with each of the measurement locations.

20. The method according to claim 8 wherein the varying step establishes the schedule as a first list for organizing the antennas within the wireless network into an antenna measuring order and a second list for organizing a radiation direction measuring order for each antenna.

21. A system for adjusting antenna radiation in a wireless network, the system comprising:

a plurality of base stations associated with corresponding antenna systems;

a plurality of local antenna controllers for controlling antenna radiation directions of the antenna

systems such that the antenna radiation directions associated with each antenna system are cycled throughout a range of antenna radiation directions;

a plurality of local schedulers for communicating with corresponding ones of the local antenna controllers, the local scheduler coordinating the antenna radiation patterns of different ones of the antenna systems in a time-division multiplex manner such that only one antenna radiation pattern from one antenna system and its associated base station is generated at any time during a measurement procedure.

22. The system according to claim 21 further comprising:

a test receiver for measuring signal strengths from the corresponding antenna systems at selected measurement locations.

23. The system according to claim 21 further comprising:

a data processing system for organizing the measured signal strengths into a location measurement matrix corresponding to each selected measurement location, the data processing system determining a resultant antenna

radiation direction within the range for each of the antennas in the wireless network or segment thereof based upon the location measurement matrices.

24. The system according to claim 23 wherein the resultant antenna radiation direction is defined as a two dimensional vector representing angle of azimuth from a corresponding antenna system and down-tilt angle from the corresponding antenna system.

25. The system according to claim 23 wherein a candidate for a resultant antenna radiation direction is defined as including a central vector representing a peak gain of a main lobe of radiation, a first limit vector representing a first limit of radiation direction states and a second limit vector representing a second limit of radiation direction states.

26. The system according to claim 21 wherein the local schedulers coordinate the antenna radiation patterns of different ones of the antenna systems such that each antenna system and its associated base station has an

assigned time slot, for transmitting at least one radiation pattern direction state, per scanning period associated with each measurement location.

27. The system according to claim 21 wherein each of the base stations is adapted to transmit a unique base station identifier code for identification of actively radiating ones of the antenna systems and their associated radiation directions.

28. A system for adjusting antenna radiation in a wireless network, the system comprising:

a plurality of base stations associated with corresponding antenna systems;

a central antenna controller for controlling antenna radiation directions of the antenna systems such that the antenna radiation directions associated with each antenna system are cycled throughout a range of antenna radiation directions;

a central scheduler for communicating with the central antenna controller, the central scheduler coordinating the antenna radiation patterns of different

ones of the antenna systems in a time-division multiplex manner such that only one antenna radiation pattern from one antenna system and its associated base station is generated at any time during a measurement procedure.

29. The system according to claim 28 further comprising:

a test receiver for measuring signal strengths from the corresponding antenna systems at selected measurement locations throughout the range.

30. The system according to claim 28 further comprising:

a data processing system for organizing the measured signal strengths into a location measurement matrix corresponding to each selected measurement location, the data processing system determining a resultant antenna radiation direction within the range for each of the antennas in the wireless network or segment thereof based upon the location measurement matrices.

31. The system according to claim 30 wherein the resultant antenna radiation direction is defined as a two dimensional vector representing angle of azimuth from a

corresponding antenna system and down-tilt angle from the corresponding antenna system.

32. The system according to claim 30 wherein a candidate for the resultant antenna radiation direction is defined as including a central vector representing a peak gain of a main lobe of radiation, a first limit vector representing a first limit of radiation direction states and a second limit vector representing a second limit of radiation direction states.

33. The system according to claim 28 wherein the central scheduler coordinates the antenna radiation patterns of different ones of the antenna systems such that each antenna system and its associated base station has an assigned time slot, for transmitting at least one radiation pattern direction state, per scanning period associated with each measurement location of the test receiver.

34. The system according to claim 28 wherein each of the base stations is adapted to transmit a unique base

station identifier code for identification of actively radiating ones of the antenna systems and their associated radiation directions.